Automatic Generation of Least-Possible-Impact Traffic Management Initiatives, Phase I

Completed Technology Project (2010 - 2010)

Project Introduction

Weather accounts for 70% of the annual cost of air traffic delays and cancellations, of which about 60% are estimated to be avoidable. Traffic Management Initiatives (TMIs), including reroutes and ground delays, are used by Air Traffic Management (ATM) operators to mitigate impact of en-route convective weather. The efficiency of today's TMIs leaves a great deal to be desired, due in part to insufficient accuracy of today's weather forecast products. As new, higher-accuracy probabilistic forecast products are beginning to emerge, there is a major functionality gap between their visual aspect (enhancing comprehension and decision making by operators) and their application in automated NextGen ATM decision support tools. Our proposal seeks to address this gap. We will develop a prototype tool for automatic generation of "Least-Impact TMIs" using probabilistic convective forecast information. This tool will generate a combination of least-deviation-from-shortest-path reroute and/or minimum ground delay for each flight predicted to be impacted by convective weather. Innovation in this proposal: ∖ New, original "step-out-and-scan" rerouting algorithm. ∖ Probabilistic forecast information converted to ATM constraints ("permeability") and used to find viable reroute paths. ∖ Combination of economical reroutes plus minimum delays resulting in least-impact traffic management solutions. We already have a suitable platform for this research: the WITI (Weather Impacted Traffic Index) toolset developed by Principal Investigator, Dr. Klein, funded by the FAA and the National Weather Service. It can ingest actual and forecast weather, traffic demand, airport and airspace capacities; as well as compute weather permeability by a flight (using the so-called scanning algorithm) and airspace capacity degradation due to weather. NASA sponsored research ("Translating Weather Information into TFM Constraints" NRA) is also using WITI technology.

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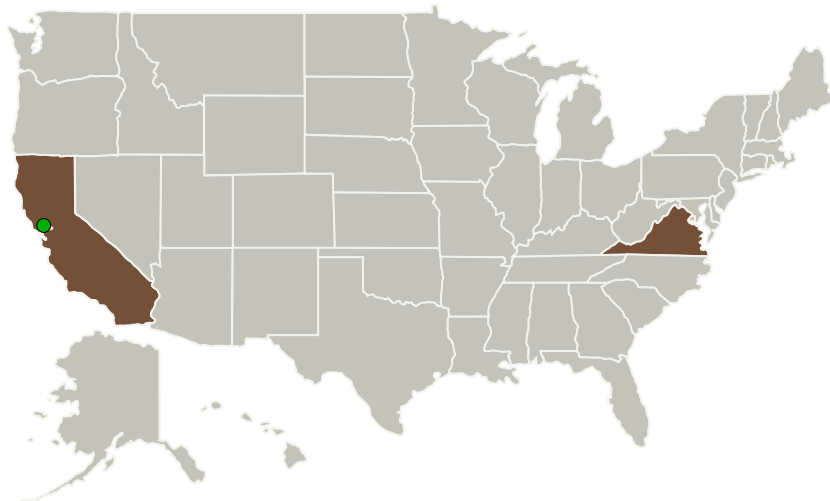
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Primary U.S. Work Locations and Key Partners

Organizations Performing Work	Role	Type	Location
Air Traffic Analysis, Inc.	Lead Organization	Industry	Fairfax, Virginia
●Ames Research Center(ARC)	Supporting Organization	NASA Center	Moffett Field, California

Primary U.S. Work Locations	
California	Virginia

Project Transitions

▶ **January 2010:** Project Start

✓ **July 2010:** Closed out

Closeout Documentation:
- Final Summary Chart(*https://techport.nasa.gov/file/138837*)

Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Organization:

Air Traffic Analysis, Inc.

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

Project Management

Program Director:
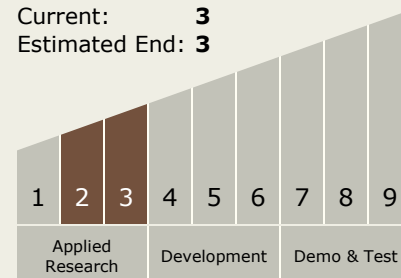
Jason L Kessler

Program Manager:

Carlos Torrez

Principal Investigator:

Alexander Klein

Technology Maturity (TRL)

Start: **2**
Current: **3**
Estimated End: **3**

1	2	3	4	5	6	7	8	9
Applied Research			Development			Demo & Test		

Technology Areas

Primary:

- TX16 Air Traffic Management
  and Range Tracking Systems
  └ TX16.3 Traffic
    Management Concepts

Target Destinations

The Sun, Earth, The Moon,
Mars, Others Inside the Solar
System, Outside the Solar
System